

Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

Supplement to: Chu VT, Yousaf AR, Chang K, et al. Household transmission of SARS-CoV-2 from children and adolescents. N Engl J Med. DOI: 10.1056/NEJMc2031915

Supplementary Appendix

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Methods

During July 17–August 24, 2020, the Centers for Disease Control and Prevention (CDC) collaborated with local and state health departments to interview all camp attendees and their parents or guardians by phone. Using a structured questionnaire, we collected demographic and clinical characteristics of camp attendees, SARS-CoV-2 testing history, preventive measures (physical distancing defined as remaining ≥ 6 feet apart from others with a separate sleeping space and bathroom, and mask use) used during their infectious period. We interviewed household contacts of index patients (i.e. camp attendees with evidence of SARS-CoV-2 infection on the basis of molecular or antigen laboratory testing), to obtain dates of exposure to, relationship with, and level of contact with the index patient during their infectious period, as well as potential SARS-CoV-2 community exposures. Laboratory test results were obtained on a voluntary basis and reported by the patients themselves on interview.

Household contacts were defined as persons who stayed ≥ 1 night in the household during the camp attendee case's infectious period (2 days prior to and up to 10 days after illness onset). Confirmed or probable cases of infection among household contacts were identified per the Council of State and Territorial Epidemiologists (CSTE) definition. Illness onset was defined as the date of symptom onset or the date of specimen collection for the first positive molecular or antigen test, whichever was earliest. For an asymptomatic patient, the illness onset was the collection date of the first positive specimen. We included households if household contacts provided sufficient information for secondary case or non-case classification. To ensure the index patient was a camp attendee, we excluded households where the illness onset of a household contact with a secondary case of infection was prior to or < 2 days after the illness onset of the camp attendee case.

This activity was reviewed by CDC and the Georgia Department of Public Health and was conducted consistently with applicable federal laws and CDC policy as defined in 45 C.F.R. part 46, 21 C.F.R. part 56;

42 U.S.C. 241(d); 5 U.S.C. 552a; 44 U.S.C. 3501 et seq. For camp attendees aged <18 years, we obtained parental or guardian permission as well as verbal assent from the camp attendee.

Results

Table S1 summarizes the demographic and clinical characteristics of the index patients and associated household contacts. Among the 526 household contacts, 351 (67%) were parents, 161 (31%) were siblings, 11 (2%) were extended family members, and 3 (1%) were non-familial contacts. More than 75% of index patients and household contacts were non-Hispanic White. Five (10%) of 48 household contacts with a secondary case of infection compared with 130 (33%) of 398 household contacts without infection reported potential community exposures. In addition, 46 (96%) of 48 household contacts with a secondary case of infection were tested one or more times for SARS-CoV-2 infection. Of the 478 household contacts who were not considered to be infected, 331 (69%) household contacts were tested.

Table S2 provides unadjusted odds ratios for secondary infection among household contacts by the household contacts' relationship to the index patient, caregiver status of the household contact, and by specific interactions between the household contact and the index patient.

Figure S1 is a flow diagram for enrollment of index patients and their household contacts.

Figure S2 illustrates the proportion of index patients who reported physical distancing during infectious period and always wearing a mask around household contacts by age of the index patient.

Table S1. Demographic and clinical characteristics of index patients and their household contacts*

	Index Patients n = 224		Household Contacts n = 526	
Characteristics	n	%	n	%
Age (years): median (interquartile range)	14 (7–19)		46 (20–51)	
Sex				
Female	115	51	262	50
Male	109	49	262	50
Unknown	0	0	2	<1
Race/ethnicity group				
Non-Hispanic White	198	88	400	76
Non-Hispanic Black	0	0	1	<1
Hispanic or Latino	9	4	10	2
Other	6	3	10	2
Unknown	11	5	101	19
≥1 underlying medical condition†	14	6	74	14
Chronic lung disease	12	6	28	6
Cardiovascular disease	0	0	26	5
Diabetes Mellitus	0	0	10	2
Immunocompromising condition or medication	0	0	10	2
Unknown medical history	9	4	87	17
Laboratory testing for SARS-CoV-2 infection‡				
Positive	224	100	46	9
Negative	0	0	331	63
Never tested	0	0	149	28

*An index patient was defined as a camp attendee with self-reported evidence of SARS-CoV-2 infection by molecular or antigen testing and the earliest illness onset in the household. A household contact was defined as a person who stayed ≥1 night in the household during the index patient's infectious period (i.e., 2 days prior to the illness onset until 10 days after the illness onset).

†Denominator was 216 for index patients and 441 for household contacts.

‡Laboratory evidence of SARS-CoV-2 infection included positive molecular or antigen testing and was self-reported.

Table S2. Unadjusted odds ratio for secondary infection among household contacts

Household contact characteristics	Univariable model*	
	uOR	95% CI
Relationship to index patients		
Parents	2.3	1.1–4.7
Siblings	1.0	reference
Extended family†	6.6	1.3–33.3
Caregiver	1.7	0.9–3.0
Specific interactions with index patient‡		
Face-to-face	4.6	2.0–10.9
Within six feet while the index patient was coughing or sneezing	3.8	1.6–8.9
Physical contact	3.3	1.6–7.1
Within six feet for ≥15 minutes	5.4	2.3–12.5
Sharing bedroom	0.9	0.2–4.5
Sharing meals	3.9	1.9–8.2
Sharing a vehicle	1.7	0.9–3.4
Sharing a bathroom	1.5	0.6–3.6

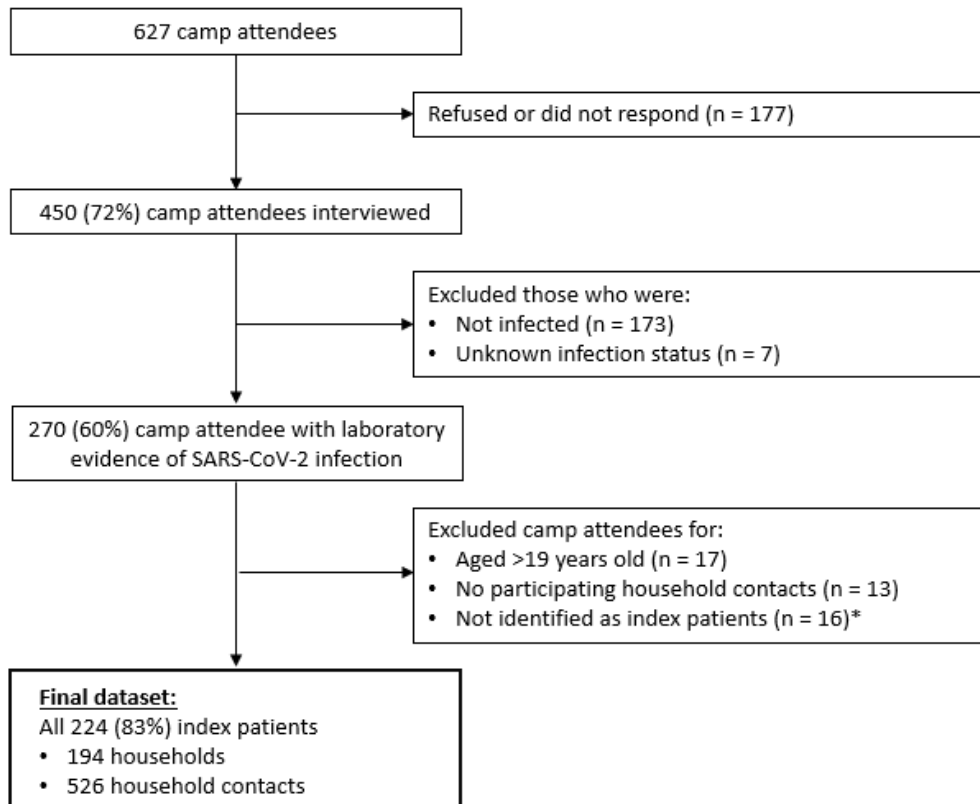
Abbreviations: uOR, unadjusted odds ratio; CI, confidence interval

*We used generalized estimating equations approach with an exchangeable correlation structure to account for intrahousehold correlation. Confidence intervals were not adjusted for multiplicity.

†Three (27%) of 11 extended family members became infected; all were grandparents aged 70 to 80 years.

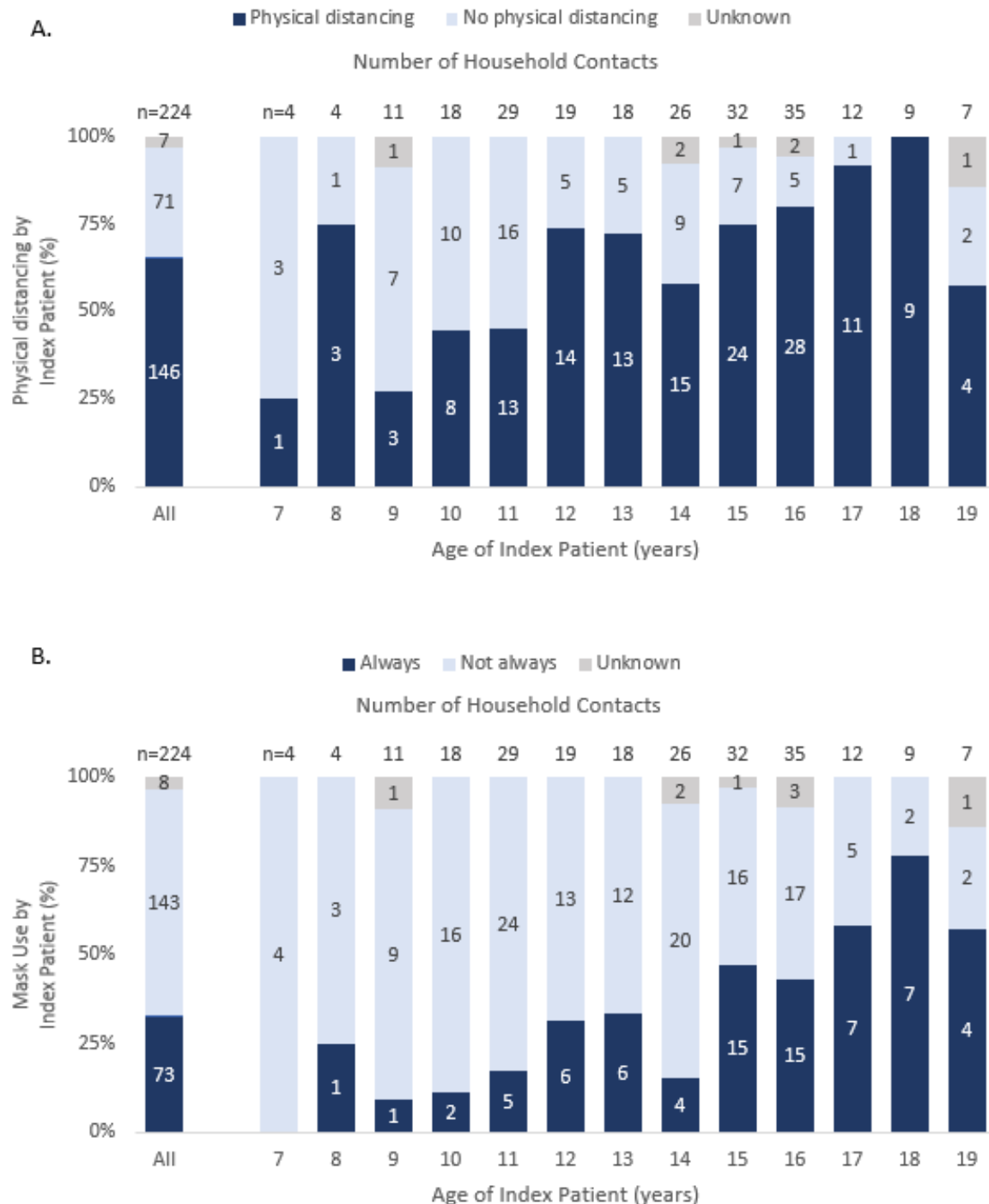
‡Household contacts without the specific interaction of interest were used as the referent group.

Figure S1. Flow diagram for enrollment of persons with SARS-CoV-2 infection identified as index patients and their household contacts



*Not identified as index patients includes 4 camp attendees with a missing illness onset, and 12 camp attendees who had household contacts with an illness onset prior to or <2 days after the illness onset of the camp attendee.

Figure S2. Proportion of index patients with SARS-CoV-2 infection who reported physical distancing during infectious period (A) and always wearing a mask around household contacts (B) by age of the index patient



Numbers denoted in the vertical bars are the number of household contacts associated with the index patients by age and physical distancing or mask use status. Numbers denoted above the vertical bars are the total number of household contacts by age of the index patient.

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